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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,707	09/17/2003	Yasuhiko Nomura	57810-077	3966
7590 09/01/2005				
McDERMOTT, WILL & EMERY 600 13th Street, N.W. Washington, DC 20005-3096		EXAMINER GOLUB, MARCIA A		
		ART UNIT 2828		
		PAPER NUMBER		

DATE MAILED: 09/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/663,707

Applicant(s)

NOMURA ET AL.

Examiner

Marcia A. Golub

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 11, 16, 18, 19, 21 and 22 is/are rejected.
- 7) ☒ Claim(s) 9, 10, 12-15, 17 and 20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/28/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 1, 16, 18, 21, and 22 are rejected under 35 U.S.C. 112, 2nd paragraph.

Claim 1 specifies the light guide layer to be only between p-type layer and active layer, but then it further specifies the said layer to be between n-type layer and p-type layer. This is inconsistent with the structure of the described invention, which specifies that there is no light guide layer between the active layer and the n-type layer.

Claim 16 specifies an impurity introduction layer to be formed in a region other than the p-type cladding layer. This is indefinite, since it is not clear from the claim where in the semiconductor laser structure the impurity introduction layer is formed.

Claims 18, 21, and 22 are using the term "at least about" which makes them indefinite according to MPEP 2173.05. While the term "about" is an acceptable term, the term "at least about" is invalid for indefiniteness since there is no indication to as to what range of the specific activity is covered by the term "about".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 6, 8, 11, 16 and 19 are rejected under 35 U.S.C. 103(a) as being obvious over Hata (U.S.Pub 2002/0008242), and further in view of Motoki et al. (U.S.Pub. 2002/0189532).

Regarding **claim 1, 3 and 8**, paragraph 15 of Hata discloses: "a nitride-based semiconductor laser device comprising: a substrate consisting of GaN" (paragraph 209);

" an n-type cladding layer [first n-type layer] formed on said substrate an active layer [light emitting layer] consisting of a nitride-based semiconductor [GaInN] (paragraph 97) formed on said n-type cladding layer; a p-type cladding layer [first p-type layer] formed on said active layer; and a light guide layer [second n-type layer that functions as an optical guide layer] (paragraph 17) formed only between said active layer and said p-type cladding layer [provided between at least the light emitting layer and the first p-type layer] in the interspaces between said active layer and said n-type and p-type cladding layers."

Hata specifies in that the substrate can be composed of GaN but does not disclose that the substrate is doped with an impurity "wherein the said impurity doped into said substrate is Oxygen." However, paragraph 126 of Motoki discloses a substrate for the light emitting devices that comprises a GaN crystal doped with Oxygen.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Motoki into the device of Hata by doping GaN substrate with Oxygen. The ordinary artisan would have been motivated to modify Hata in the manner set forth above for at least the purpose of creating a substrate that has good cleavage and good conduction, which allows a bottom n-electrode to be placed on the opposite side of the substrate.

Regarding **claim 2**, Hata and Motoki disclose a nitride-based semiconductor laser device as described above, in addition "said substrate absorbs part of light generated in said active layer." Absorption of light by the substrate is an inherent feature of the structure that does not have light guide layer between the active layer and the substrate. (Example: JP 2002-124737 as sighted by the applicant)

Regarding **claims 4, 11, and 19**, Hata and Motoki disclose a nitride-based semiconductor laser device as described above, "further comprising a p-side contact layer formed on said p-type cladding layer" [p-type contact layer] (paragraph 101 of Hata) in addition "said p-side contact layer, n-type cladding layer and a light guide layer are undoped." Hata and Motoki do not specify whether or not the p-side contact layer, the n-type cladding layer and the light guide layer are doped. However, using undoped layers in a semiconductor device is well known in the art. An undoped layer has an advantage that the charge carrier absorption and the scattering of charge carriers at ionized defects is reduced in the immediate junction region.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Hata and Motoki in the manner set forth

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above for at least the purpose of reducing the absorption of light by the specified layers and therefore reducing the current needed to operate the laser.

Regarding **claim 6**, Hata and Motoki disclose a nitride-based semiconductor laser device as described above, in addition “a layer, formed between said substrate and said n-type cladding layer consisting of an undoped nitride-based semiconductor.” [undoped GaN layer] (paragraph 97 of Hata)

Regarding **claim 16**, Hata and Motoki disclose a nitride-based semiconductor laser device as described above, in addition “an impurity introduction layer [current-blocking layer] formed by introducing an impurity [SiN] into a region other than said p-type cladding layer [on top of the p-cap layer] and a current path [strip opening becomes a current path] part of a nitride-based semiconductor layer formed on said p-type cladding layer. (paragraph 100 of Hata)

Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being obvious over Hata (U.S.Pub 2002/0008242) and Motoki et al. (U.S.Pub. 2002/0189532) as applied to claims 1 and 6 and further in view of and Goetz et al. (U.S.Pat.6,441,393) .

Regarding **claims 5 and 7** Hata and Motoki disclose a nitride-based semiconductor laser device as described above, but do not disclose that the said n-type cladding layer is doped with Ge. The nitride-based semiconductor laser device disclosed above “further comprises a layer, formed between said substrate and said n-type cladding layer, consisting of a nitride-based semiconductor” [undoped GaN layer]. Hata does not specify the said layer to be doped with Ge. However, column 2 lines 13-

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21 of Goetz discloses a semiconductor device with n-type layers of III-V nitride doped with Ge.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Goetz into the device of Hata by doping the said n-type nitride based layers with Ge. The ordinary artisan would have been motivated to modify Hata in the manner set forth above for at least the purpose of improving conductivity and providing longer wavelength light emission.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Allowable Subject Matter

Claims 9, 10, 12-15, 17, 18, 19-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to provide or suggest the nitride based semiconductor laser with disclosed parameters and components.

A laser with only one light guide layer provided only between the active layer and the p-type cladding layer in combination with a p-type cladding layer with a lattice constant smaller than GaN and InGaN light guide layer with a lattice constant larger than GaN; n-type carrier blocking layer with a refractive index smaller than the n-type cladding layer; Al_xGaN n-type cladding layer and Al_yGaN n-type carrier blocking layer where $y > x$ and $E_g(\text{carrier blocking layer}) > E_g(\text{cladding layer})$ and $E_g(\text{carrier blocking layer}) > E_g(\text{active layer})$; an impurity introduction layer formed by ion implantation where the impurity is Carbon with concentration of $5 \times 10^{19} \text{ cm}^{-3}$; p-side contact layer with the thickness between 3 and 5 nm and smaller than quantum well layer.

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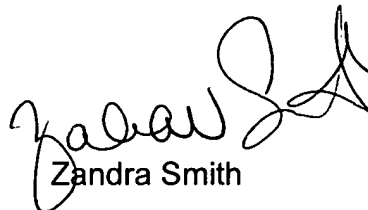
Fax/Telephone Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marcia A. Golub whose telephone number is 571-272-0218. The examiner can normally be reached on M-F 8-5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Zandra Smith